US-APWRRAIsPEm Resource

From: Ciocco, Jeff
Sent: Thursday, June 07, 2012 10:24 AM
To: US-APWRRAIsPEm Resource
Cc: Reyes, Ruth; Ward, William
Subject: FW: US-APWR Topical Report MUAP-07001 RAIs
Attachments: US-APWR Topical Report MUAP-07001 Request for Additonal Information.pdf

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U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

From: Reyes, Ruth
Sent: Friday, June 01, 2012 2:28 PM
To: 'us-apwr-rai@mhi.co.jp'
Cc: Ciocco, Jeff; 'Rebecca_Steinman@mnes-us.com'; Hsii, Yi-Hsiung; Schmidt, Jeffrey; Zigh, Ghani; Armstrong, Kenneth; 'Rohatgi, Upendra S'; Murphy, Crystal
Subject: US-APWR Topical Report MUAP-07001 RAIs

MHI,

The attachment is a final RAI for Topical Report MUAP-07001 "The Advanced Accumulator." This RAI was sent to you in draft form. Your licensing review schedule assumes technically correct and complete responses within 30 days of receipt of RAIs. MHI requests and we grant 60 days to answer the RAI questions. The schedule will be adjusted accordingly.

Please submit you RAI response to the NRC Document Control Desk.

Thanks,

Ruth C Reyes
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Sent Date: 6/7/2012 10:23:53 AM
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From: Ciocco, Jeff

Created By: Jeff.Ciocco@nrc.gov

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"Reyes, Ruth" <Ruth.Reyes@nrc.gov>
Tracking Status: None
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Tracking Status: None
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REQUEST FOR ADDITIONAL INFORMATION TOPICAL REPORT
THE ADVANCED ACCUMULATOR
MUAP-07001, REVISION 4

06/01/12

US-APWR TOPICAL REPORT

Mitsubishi Heavy Industries

Docket No. 52-021

By letters dated August 31, 2011, Mitsubishi Heavy Industries, Ltd. (MHI) submitted revision 4 of the topical report MUAP-07001, "The Advanced Accumulator," and revision 2 of the technical report MUAP-09025, "CFD Analysis for Advanced Accumulator." The NRC staff has identified that additional information is needed to continue portions of the review.

94. In Appendix A of MUAP-09025(R2), MHI provides the calculation of the Grid Convergence Index (GCI) for their mesh refinement strategy for the advanced accumulator (ACC) computational fluid dynamics (CFD) calculation model. Tables A-1 and A-2 of the report summarize the calculation procedure and the resulting GCI values for various cases of the large-flow and small-flow injection for the 1/2- and 1/1-scale CFD models, respectively. The NRC staff found the resulting GCI values questionable due to high observed order of accuracy, p-values (significantly larger than the expected p-value of between 1 and 2). These high observed p-values are likely due to a non-systematic grid refinement approach in the grid convergence study. Larger p-values result in smaller GCI values, and, in turn, smaller scaling bias of the flow coefficient, C_v.

    (a) Justify the adequacy of the GCI values in Table A-1 and A-2, or re-calculate the GCIs with additional CFD grid refinement and appropriate mesh resolution to ensure reasonable observed p values (expected p-value of between 1 and 2). If MHI opts to minimize its effort of re-calculating the GCIs for all cases in Tables A-1 and A-2, use of a conservative p-value is acceptable if properly justified (the chosen P-value is demonstrated to bound all expected cases). Please provide figures for the revised calculations similar to Figures A-4 and A-5 of Appendix A.

    (b) Recalculate the scaling biases for the ACC flow coefficients for the large-flow and small-flow injection phases based on the CFD GCIs determined in item (a) above. MHI may also choose other scaling bias values if they can be properly justified and are bounding.

    (c) Provide re-analyses of the large-break and small-break LOCAs based on the revised scaling biases for the ACC flow coefficients obtained in item (b) above. MHI may also determine the peak cladding temperature impact of the revised ACC scaling biases by the re-analysis of the bounding cases in the current large-break and small-break LOCA analyses if the bounding cases chosen are properly justified. For the NRC staff evaluation, MHI should provide at a minimum the comparison of the results of the re-analysis with the revised scaling biases and the corresponding cases with previous scaling biases. The results

should be presented with time history figures or tables displaying the following parameters:

- Peak Cladding Temperature
- Accumulator flow rate
- Break flow rate
- Break void fraction
- Core inlet flow rate
- Lower plenum inventory
- Core inventory
- System pressure


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